

28-OCT-09
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GEORGIA DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM
REVISED: JUNE 30, 2008
40' CURB-CURB; 6 BEAMS; 99' SPAN; 60' TALL; BRIDGE 13 ; PIER 18

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL			* * * CAP				
OPTIONS											EC KSI	ES KSI	STRAIN	FACT	MAIN SIZE	STR TOP	MAX	MAX	MIN	MIN	NO.	CL.	S.SP	INCR.	CL.
D D D L	2	1	13	0-00-00		3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00	

COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE	I
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	P
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	22.22	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999	

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	21.625	6.000	4.000	6.000	6.000	4.000	15.625	18.000	7.200	4.800					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		60.000	0.000	12.000	6.000	12.000	6.000	6.000	0.000	12	6	11	12	6	11	34	16	11	34	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	14.000	14.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND

SUPERSTRUCTURE AREA*STD.	TRANS.	LONG.	WIND FT1	FT1	WIND ON SUPERSTRUCTURE INTENSITIES	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* WIND FORCE APT	ARM APL	* WIND ON PIER PL
960.	1921.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	7.676	22.712

GROUP III WIND

STD. * WIND ON SUPERSTRUCTURE INTENSITIES	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* STD. * WIND ON LIVE LOAD INTENSITIES	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* LENGTHS OF LL TRANS.	LONGI.	* WIND ON LL APT	LL ARMS APL
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	98.5	197.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI. FT	TRACTION FL	FORCE APT	AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW PL
0.000	7.204	15.583	15.583	0.00018000	0.00044000	0.000	0.000

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	189.293	216.586	0.000	433.171	0.000	216.586	189.293					
LL 1	1	63.582	45.415	0.000	0.000	0.000	0.000	0.000					
LL 2	2	63.582	78.720	0.000	75.692	0.000	0.000	0.000					
LL 3	3	63.582	78.720	0.000	151.386	0.000	33.304	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	45.415	63.582					
LL 5	2	0.000	0.000	0.000	75.692	0.000	78.720	63.582					
LL 6	3	0.000	33.304	0.000	151.386	0.000	78.720	63.582					
LL 7	1	0.000	22.707	0.000	86.289	0.000	0.000	0.000					
LL 8	2	43.901	86.290	0.000	87.803	0.000	0.000	0.000					
LL 9	3	43.901	86.290	0.000	152.899	0.000	43.901	0.000					
LL10	2	0.000	33.304	0.000	151.386	0.000	33.304	0.000					
LL11	3	63.582	78.720	0.000	151.386	0.000	33.304	0.000					
LL12	2	63.582	45.415	0.000	0.000	0.000	45.415	63.582					
LL13	3	63.582	78.720	0.000	75.692	0.000	45.415	63.582					

COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

* LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	60.000	0.000	0.000	0.000	6.000	1.000	60.000	60.000
DEAD LOAD TOTAL	1	1500.079	0.000	0.000	0.000	2083.279	6968.190	-6968.190	0.000	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-155.484	-7.204	-544.500	-544.500
WIND ON SUBSTR.	1	0.000	-46.056	7.676	460.560	0.000	0.000	0.000	-136.272	-22.712	-1362.720	-1362.720
GROUP 2 WIND 1 1	1	0.000	-688.056	55.676	3694.560	0.000	0.000	0.000	-136.272	-22.712	-1362.720	-1362.720
GROUP 2 WIND 1 2	1	0.000	-688.056	55.676	3694.560	0.000	0.000	0.000	136.272	22.712	1362.720	1362.720
GROUP 2 WIND 2 1	1	0.000	-611.016	49.916	3306.480	0.000	0.000	0.000	-290.432	-34.238	-2139.284	-2139.284

											PIER-40-6-99-60.OUT				
GROUP	WIND	2	2	1	0.000	-611.016	49.916	3306.480	0.000	0.000	0.000	290.432	34.238	2139.284	2139.284
GROUP 2	WIND	3	1	1	0.000	-572.496	47.036	3112.440	0.000	0.000	0.000	-444.592	-45.764	-2915.849	-2915.849
GROUP 2	WIND	3	2	1	0.000	-572.496	47.036	3112.440	0.000	0.000	0.000	444.592	45.764	2915.849	2915.849
GROUP 2	WIND	4	1	1	0.000	-469.776	39.356	2595.000	0.000	0.000	0.000	-547.366	-53.448	-3433.558	-3433.558
GROUP 2	WIND	4	2	1	0.000	-469.776	39.356	2595.000	0.000	0.000	0.000	547.366	53.448	3433.558	3433.558
GROUP 2	WIND	5	1	1	0.000	-264.336	23.996	1560.120	0.000	0.000	0.000	-624.446	-59.211	-3821.840	-3821.840
GROUP 2	WIND	5	2	1	0.000	-264.336	23.996	1560.120	0.000	0.000	0.000	624.446	59.211	3821.840	3821.840
GROUP 3	WIND	1	1	1	0.000	-419.009	26.553	1852.860	0.000	0.000	0.000	-40.882	-6.814	-408.816	-408.816
GROUP 3	WIND	1	2	1	0.000	-419.009	26.553	1852.860	0.000	0.000	0.000	40.882	6.814	408.816	408.816
GROUP 3	WIND	2	1	1	0.000	-370.386	23.643	1647.097	0.000	0.000	0.000	-138.152	-12.635	-820.464	-820.464
GROUP 3	WIND	2	2	1	0.000	-370.386	23.643	1647.097	0.000	0.000	0.000	138.152	12.635	820.464	820.464
GROUP 3	WIND	3	1	1	0.000	-346.075	22.188	1544.216	0.000	0.000	0.000	-235.422	-18.457	-1232.111	-1232.111
GROUP 3	WIND	3	2	1	0.000	-346.075	22.188	1544.216	0.000	0.000	0.000	235.422	18.457	1232.111	1232.111
GROUP 3	WIND	4	1	1	0.000	-281.244	18.308	1269.865	0.000	0.000	0.000	-300.269	-22.338	-1506.543	-1506.543
GROUP 3	WIND	4	2	1	0.000	-281.244	18.308	1269.865	0.000	0.000	0.000	300.269	22.338	1506.543	1506.543
GROUP 3	WIND	5	1	1	0.000	-151.582	10.548	721.163	0.000	0.000	0.000	-348.904	-25.249	-1712.366	-1712.366
GROUP 3	WIND	5	2	1	0.000	-151.582	10.548	721.163	0.000	0.000	0.000	348.904	25.249	1712.366	1712.366
LIVE LOAD	LL	1	1	1	108.997	-1634.958	0.000	1634.958	108.997	1634.958	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL	2	1	1	217.994	-1994.652	0.000	1994.652	217.994	1994.652	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

													TRANSVERSE			* LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF						
LIVE LOAD	LL	3	1	294.293	-1471.472	0.000	1471.472	294.293	1795.187	-323.715	0.000	0.000						
LIVE LOAD	LL	4	1	108.997	1634.958	0.000	-1634.958	108.997	0.000	-1634.958	0.000	0.000						
LIVE LOAD	LL	5	1	217.994	1994.652	0.000	-1994.652	217.994	0.000	-1994.652	0.000	0.000						
LIVE LOAD	LL	6	1	294.293	1471.472	0.000	-1471.472	294.293	323.715	-1795.187	0.000	0.000						
LIVE LOAD	LL	7	1	108.996	-245.236	0.000	245.236	108.996	245.236	0.000	0.000	0.000						
LIVE LOAD	LL	8	1	217.994	-1722.150	0.000	1722.150	217.994	1722.150	0.000	0.000	0.000						
LIVE LOAD	LL	9	1	294.292	-1123.217	0.000	1123.217	294.292	1549.935	-426.718	0.000	0.000						
LIVE LOAD	LL	10	1	217.994	0.000	0.000	0.000	217.994	359.683	-359.683	0.000	0.000						
LIVE LOAD	LL	11	1	294.293	-1471.472	0.000	1471.472	294.293	1795.187	-323.715	0.000	0.000						
LIVE LOAD	LL	12	1	217.994	0.000	0.000	0.000	217.994	1634.958	-1634.958	0.000	0.000						
LIVE LOAD	LL	13	1	294.292	-323.725	0.000	323.725	294.292	1795.187	-1471.462	0.000	0.000						

□ CAP ANALYSIS AND DESIGN DATA

														CAP MOMENTS AND SHEARS							
														MOMENTS(KIP-FEET)				** SHEARS(KIPS)			
POINT	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT								
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-265.014	-18.933	-265.014	-18.933	-403.050								
P 2	-2109.308	-2109.308	-3103.170	-2109.308	-2109.308	-2109.308	-2704.435	-314.291	-595.853	-314.291	-595.853	-452.327	-904.790								
P 3	-5066.186	-5066.186	-7542.950	-5066.186	-5066.186	-5066.186	-6549.278	-637.330	-637.330	-637.330	-637.330	-946.268	-946.268								
C 1L	-9058.647	-9058.647	-13389.037	-9058.647	-9058.647	-9058.647	-11651.695	-693.490		-693.490		-1002.428									
C 1R	-9058.647	-9058.647	-13389.037	-9058.647	-9058.647	-9058.647	-11651.695		693.490		1002.428		693.490								
P 5	-5066.186	-5066.186	-7542.950	-5066.186	-5066.186	-5066.186	-6549.278	637.330	637.330	946.268	946.268	637.330	637.330								
P 6	-2109.308	-2109.308	-3103.171	-2109.308	-2109.308	-2109.308	-2704.435	595.853	314.291	904.790	452.327	595.853	314.291								
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	265.014	18.933	403.050	18.933	265.014	18.933								

																CAP DESIGN DATA													
																LEFT STIRRUPS		RIGHT STIRRUPS		D		FC		PS		FS/FF		FS/FZ	
PT.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE. AS NO. SIZE.		BOT. REINFORCE. AS NO. SIZE.		M.SP. AV/IN BAR&SPAC		M.SP. AV/IN BAR&SPAC		D IN.		FC PSI		PS %		FS/FF RATIO		FS/FZ RATIO										
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.00	#5@ 0.00	24.00	0.060	#5@10.33	59.14			0.08	0.000	0.099											
P 2	-1622.544	-2080.335	10.21	7 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.086	#5@ 7.24	81.25			0.18	0.444	1.113											
P 3	-3897.066	-5037.906	18.58	12 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.060	#5@10.33	96.00			0.31	0.609	1.116											
C 1	-6968.190	-8962.843	33.78	22 # 11	3.12	2 # 11	24.00	0.071	#5@ 8.73	24.00	0.071	#5@ 8.73	96.00			0.55	0.595	0.975											
P 5	-3897.066	-5037.906	18.58	12 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.060	#5@10.33	96.00			0.31	0.609	1.116											
P 6	-1622.544	-2080.335	10.21	7 # 11	3.12	2 # 11	24.00	0.086	#5@ 7.24	24.00	0.060	#5@10.33	81.25			0.18	0.444	1.113											
P 7	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.14			0.08	0.000	0.099											

NOTE: *** FS/FZ RATIO EXCEEDS 1.0! ***

COLUMN ANALYSIS AND DESIGN OUTPUT

CRITICAL COLUMN LOADS																					
CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T		1	LL	2	0.0				2423.4	-4330.4	0.0	2423.4	4589.0	1830.9	14814.4	28090.5	11207.1	6.120	72.00	144.00
1	B		2		5.1					2708.3	2028.2	-4968.4	2708.3	3409.6	5993.7	9554.0	11996.6	21088.6	3.520	72.00	144.00

COLUMN DESIGN DATA																				
CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	2802.	49720.	1.060	1.259	1.000	2	0.70
1	B		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	2329.	49720.	1.049	1.206	1.000	2	0.70

FOOTING 1 DESIGN LOADS																			
F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL	3	4.1			2324.068	2473.818	18.308	-2976.692	-41.789	189.513	67.793	168.695	290.416	-0.762	0.000	0.000	MAX.P1
1	2		4.1				2708.263	3373.500	51.163	-4463.625	-69.482	231.202	47.499	189.751	373.455	-0.990	0.000	0.000	MAX.MT
1	2		4.1				2708.263	3373.500	51.163	-4463.625	-69.482	231.202	47.499	189.751	373.455	-0.990	0.000	0.000	MAX.VT
1	2		4.1				2708.263	3373.500	51.163	-4463.625	-69.482	231.202	47.499	189.751	373.455	-0.990	0.000	0.000	MAX.VP
1	2		5.1				2708.263	2028.156	31.195	-4968.392	-76.974	269.884	65.470	151.070	355.484	247.326	22.953	0.000	MAX.ML
1	2		5.1				2708.263	2028.156	31.195	-4968.392	-76.974	269.884	65.470	151.070	355.484	247.326	22.953	0.000	MAX.VL
1	2		3.1				2083.279	3112.440	47.036	-2915.849	-45.764	156.332	36.264	167.478	287.547	-0.762	0.000	0.000	MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS													
FOOTING SIZE			* BAR REINFORCEMENT STEEL *						SECTION CAPACITIES				*
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC	
14.500	14.500	4.500	0.989	0.00	0 # 0	@ 0.000	TOP TRAN	0.000	0.000	0.000	38.365	0.000	
				1.48	17 #10	@10.125	BOT.LONG	248.675	46.302	92.604	38.365	0.000	

NUMBER OF PILES = 14 BP = 2.000 DP = 2.000